

REMARKS

File History

In the Office action of 12/14/2005, the following allowances, rejections, objections and other actions appear to have been made:

> Claims 1-15 were rejected under 35 USC §103(a)/102(e) as being obvious over You (US 6,706,613) in combination with Wang (US Pub 2005/0110102 published 5/26/05 on basis of application filed 11/25/03).

Summary of Current Response

>> Claims 16-20 are canceled without prejudice.

>> Claims 1, 4-15 are amended.

>> Claims 21-23 are newly submitted.

Arguments are presented concerning the applied art and bases of rejection.

Applicants' Overview of Outstanding Office Action

Applicant sees the outstanding Office action of 12/14/2005 as having the following major features:

(1) Overlooked in the action is the fact that You forms a single, nitrogen containing film (col. 6. lines 49-54) over the sidewalls before subjecting the thus protected sidewalls (unexposed sidewall materials) to an unspecified oxidation process.

(2) Despite there being an astronomically large number of generic oxidation processes to be picked from for oxidizing the film-protected sidewall of You, the PTO has without giving any reason for doing so, picked Wang from all the possibilities. This did not occur by happenstance, but rather through the tempting forces of hindsight.

Applicants' detailed reading of the cited You '613 reference

Claim 1 (as currently amended) calls for, among other things: "at least three exposed material layers respectively composed of different materials" [*Emphasis added.*]

By contrast, the relied upon You reference calls for the formation of a protective, nitrogen containing film over the different layers of its ONO sidewall. More specifically, at col. 2, lines 47-52 (SUMMARY OF THE INVENTION), You states: "According to ... the invention, pre-annealing is performed on the stacked gate in a first atmosphere comprising nitrogen. At least a portion of the stacked gate sidewalls of the stacked gate that has been pre-annealed is oxidized." [*Emphasis added.*] At col. 6, lines 25-51 You explains in more detail what he is teaching to one of ordinary skill:

Without wishing to be bound by any theory of operation, when the substrate 100 is pre-annealed with the first atmosphere comprising nitrogen, a film containing nitrogen appears to be formed on the surface of the substrate 100 and on the sidewalls 102a of the stacked gate 120.

Without wishing to be bound by any theory of operation, the oxidizing agents do not appear to permeate into the central portion of the ONO layer 108 due to the film containing nitrogen that was previously formed on the surface of the substrate 100 and on the sidewalls 120a ...

[*Emphasis added.*]

The outstanding grounds of rejection conveniently ignore this nitrogen containing film that is formed prior to the oxidation step and its important function during the oxidation process. The nitrogen containing film covers the exposed silicon surface parts of You's ONO stack and thus reduce the permeation of oxygen into the silicon portions during the subsequent oxidation step. Nowhere does You teach or suggest a quickly extinguishing oxidizing agent as a supplemental or alternate method to his nitrogen-containing, protective film.

Applicants' detailed reading of the cited Wang '102 reference

Wang discusses ONO stacks (see Abstract) but does not teach or suggest use of a quickly extinguishing oxidizing agent for reducing Birds Beak in the ONO stack after three or more layers of the ONO stack have been formed so as to be exposed at a sidewall.

The outstanding grounds of rejection do not explain why, out of all the oxidation techniques available, including all the ISSG recipes available, the ordinary artisan would be motivated to specifically pick Wang out as the recipe to use for the sidewall oxidation of You. Use of hindsight in the formulation of this rejection is obvious. The proffered reason regarding thermal budget does not fly because other techniques of lower temperature oxidation, i.e. LPCVD can offer even better thermal budgets. See for example: http://www.me.umn.edu/education/courses/me8254/Lecture_09.pdf which includes a slide entitled Low Temperature Oxidation of Silicon and mentions APCVD, LPCVD and PECVD as three possibilities. If indeed the artisan were interested in thermal budget, he will surely bypass Wang and head for these much lower temperature options.

Referring to Figs. 4B-4E of Wang, patterning occurs between 4B-4C and then in 4E (after implant of buried source/drain 432), layer 426 is the middle SiN portion of the ONO structure being formed (page 4, left col., top most paragraph). So an ONO-type memory cell stack with at least three different layers is not yet in being at this stage of Wang Fig. 4E. Then in Fig. 4F, the RTO oxidation is carried out to form the top oxide 428 of the ONO stack at the same time that the gate oxide 436 is formed (paragraph [0038]) and the circularly-shaped oxide region 434 for the buried diffusion 432 is formed. Trench isolation 404 does not further oxidize. An ordinary artisan following the teachings of Wang would control the ISSG process to form the desired and operable thickness of the gate oxide 436 and the buried oxide 434. Wang does not teach and the ordinary artisan would not see, the applicability of Wang's ISSG for controlling Bird's Beak formation in an ONO-type memory stack having at least three exposed materials in its sidewall as the sidewall dielectric is being formed.

Notwithstanding the above arguments, Applicant is not conceding that Wang is a viable reference under 35USC 102(e) because it has not been ascertained whether Wang satisfies all the provisions of 35 USC 112.

Regarding paragraph [0032] of Wang, the PTO-supplied argument that $x+y=1$ is an argument based on circular and speculative logic. Saying that $x+y=1$ is saying that $x/(x+y)=x$ and that y does not even count. Wang does not say that y does not count. Wang does not say what his "ratio" represents in paragraph [0032]. In the Example 1 of paragraph [0042] H_2 is 2slm and O_2 is 8slm so that H_2/O_2 in terms of slm is 0.25. In Example 3 of paragraph [0046] H_2 is 6slm and O_2 is 12slm so that H_2/O_2 in terms of slm is 0.5. Wang does not provide an example where the H_2/O_2 ratio in terms of volumetric flow is less than 0.2.

Notes re Specific claims

Since claims 1, 4-15 are amended above, the outstanding grounds of rejection are mooted to some extent. Nonetheless, with regard to Claim 9, neither of You and Wang suggests that a dry ISSG be applied to a stack sidewall having exposed thereat its, first silicon layer and first silicon oxide as well as first silicon nitride. Fig. 2C of You invariably includes the protective nitrogen-containing film before oxidation proceeds. In Fig. 4E of Wang, diffusion region 432 is not part of a sidewall.

With regard to Claim 11, neither of You and Wang suggests that a dry ISSG be applied to a stack sidewall having further exposed thereat its, second silicon nitride layer.

With regard to Claim 12, the PTO admits that both of You and Wang are deficient in teaching the recited height variation ratio. Recent case law prohibits the use of speculation and per se rules. As the PTO Board of Appeals has stated in for example: Ex Parte McLoone et al (decided 04-Nov-04, designated as supposedly nonprecedential, and reported at:

<http://www.uspto.gov/web/offices/dcom/bpai/decisions/fd041307.pdf>

As stated by the Federal Circuit in In re Ochiai, 71 F.3d 1565, 1572, 37 USPQ2d 1127, 1133 (Fed. Cir. 1995), "**reliance on per se rules of obviousness is legally incorrect and must cease.**" To set forth a prima facie case of obviousness the examiner must establish that the applied prior art itself would have fairly suggested, to one of ordinary skill in the art, the desirability of the examiner's proposed modification of the prior art, see Fritch, 972 F.2d at 1266, 23 USPQ2d at 1783-84. [*Emphasis added.*]

Moreover, it is respectfully submitted that the Office action reliance on In re Aller and In re Woodruff is misplaced. It is not logical to read those cases as saying that all "discoveries" are obvious because it is mere finding of optimal points by routine experimentation. The patent statute, 35 USC §100 specifically says that "(a) The term 'invention' means invention or discovery." That definition was not placed there willy-nilly. Judge Giles Rich (deceased) who authored that provision of the 1952 Patent Act has been quoted as explaining that the step of discovering some new phenomenon and making practical use of it is as much an act of invention as is the act of thinking something up. Many a patent are based on the inventors having carried out sweat-of-the-brow experimentation and having spotting a significant phenomenon and having recognized the importance of that hitherto unavailable information. It could not have been "obvious" to the persons of ordinary skill from the thin blue air because the experimental results were not available to the ordinary artisans at the relevant time.

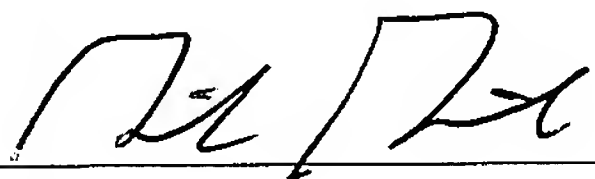
Similarly with regard to Claims 13-14, the PTO has not provided any evidence to support its speculation regarding how lateral sidewall breakdown voltages may be uniform or not along the height of an ONO-type memory cell stack after formation of the sidewall dielectric by the dry ISSG process and regarding how erase speed is affected in a memory cell having an ONO-type memory cell stack after formation of its sidewall dielectric by the recited dry ISSG process. It is legally improper to speculate on what "should" happen. It is incumbent on the PTO to provide supporting evidence of what does happen under the same conditions.

CONCLUSION

In light of the foregoing, Applicant respectfully requests that the outstanding grounds of rejection be withdrawn and the amended claims be reconsidered and allowed. Should any other action be contemplated by the Examiner, it is respectfully requested that he contacts the undersigned at (408) 392-9250 to discuss the application.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-2257 for any matter in connection with this response, including any fee for extension of time and/or fee for additional claims, which may be required.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on March 14, 2006.



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3/13/06

Date of Signature

Respectfully submitted,



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